

WHAT IS CLAIMED IS:

1. A method for analyzing tissue based on quantized magnetic resonance data comprising the steps of

- a) selecting at least one magnetic resonance parameter to characterize a body part, organ or tissue,
- b) selecting a suitable pulse sequence to quantify that selected magnetic resonance parameter,
- c) using the selected pulse sequence to acquire multiple sets of magnetic resonance signals from the body part, organ or tissue at an unchanged position relative to the measurement acquisition system,
- d) quantifying the magnetic resonance imaging parameters on a pixel by pixel basis,
- e) determining biological properties of interest of a body part, organ or tissue structure by biological means including histological, biochemical, histochemical, and biomechanical,
- f) correlating quantitative ranges of the selected magnetic resonance parameters with selected biological properties of interest of a body part, organ or tissue.

2. The method as defined by claim 1 wherein in step a) the magnetic resonance parameter is selected from longitudinal relaxation time (T_1), transverse relaxation time (T_2), magnetization transfer (MT), and magnetization ratio (MR).

3. The method as defined by claim 2 wherein the tissue is cartilage.

4. The method as defined by claim 3 and further including the step of:
d) creating an image of the tissue based on representation of sets of one or more quantitative magnetic resonance parameters.

5. The method as defined by claim 1 and further including the step of:
f) creating an image based on representation of sets of one or more quantitative magnetic resonance parameters.

6. A method for analyzing tissue based on quantized magnetic resonance data comprising the steps of

- a) acquiring magnetic resonance signals from the tissue,

4 b) determining at least one magnetic resonance quality of tissue in each
 5 pixel,
 6 c) quantizing the magnetic resonance signals pixel by pixel within the
 7 tissue, and
 8 d) correlating the determined magnetic resonance quality with known
 9 magnetic resonance qualities of tissue.

1 *Sub 7* 7. The method as defined by claim 6 wherein in step c) the magnetic
 2 resonance quality is selected from longitudinal relaxation time (T_1), transverse relaxation
 3 time (T_2), magnetization transfer (MT), and magnetization ratio (MR).

1 8. The method as defined by claim 7 wherein the tissue is cartilage.

1 *Sub A3* 9. The method as defined by claim 8 and further including the step of:
 2 d) creating an image of the tissue based on the determined magnetic
 3 resonance quality.

10 10. The method as defined by claim 6 and further including the step of:
 11 d) creating an image of the tissue based on the determined magnetic
 12 resonance quality.

13 11. Magnetic resonance apparatus for use in analyzing a body comprising:
 14 a) means for establishing a magnetic field through the body,
 15 b) means for exciting nuclei spins in the body with an RF signal oriented
 16 at an angle with respect to said magnetic field,
 17 c) means for receiving magnetic resonance signals from the excited
 18 nuclei representative of said nuclei spins,
 19 d) repeating steps b) and c) to obtain a multiplicity of sets of magnetic
 20 resonance signals and determining a magnetic resonance quality from the body, and
 21 e) means for quantizing the magnetic resonance quality pixel by pixel
 22 within the body.

1 *Sub B1* 12. Apparatus as defined by claim 11 wherein the magnetic resonance
 2 quality is T_2 relaxation time.

1 13. Apparatus as defined by claim 12 wherein steps b), c), and d) are pulse
2 echo sequences with varying echo times.

1 14. Apparatus as defined by claim 11 wherein the magnetic resonance
2 quality is chosen from T1 relaxation time, T2 relaxation time, and magnetic ratio.

1 15. Apparatus as defined by claim 11 and further including
2 f) a display for imaging the magnetic resonance qualities pixel by pixel.

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